Six new *Alchemilla* species from northeastern Anatolia

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Abstract:
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Six new *Alchemilla* species from northeastern Anatolia are described, their chromosome numbers are published and a key for the determination of the species of NE- and E-Anatolia is provided.

Zusammenfassung:
Sechs neue *Alchemilla*-Arten aus Ost-Anatolien werden beschrieben, ihre Chromosomenzahlen angegeben und ein Schlüssel zur Bestimmung der Arten NO- und O-Anatoliens angeboten.

Introduction

Northern Anatolia and the adjacent parts of Caucasia and Iran is one of the most interesting area for the genus *Alchemilla* in Eurasia. It proved to be very rich in species of the subsection *Calycanthum* and within this subsection of the series *Elatae*. Since the publication of the fourth volume of Davis' Flora of Turkey there has been published a number of new species not only of this subsection (KALHEBER (1994); HAYIRLIOGLU-AYAZ & BEYAZOGLU (1997(1)) and some species already known from Caucasia have been discovered in NE-Anatolia (HAYIRLIOGLU & BEYAZOGLU (1997(2)). The German author has had the opportunity to look at a fine collection of *Alchemilla* specimens of the Turkish author from the vilayets of Trabzon and Rize and found among well known species some of which are new to the vilayet of Trabzon. Besides these he could find specimens that could be assigned to six new species, 4 from Trabzon and 2 from Rize. All these new species belong to the series *Elatae*. They are described as new species in this paper. The names that are given to these species are proposed by the Turkish author who has also counted the chromosome numbers.

The terminology follows Pawlowski & Walters in DAVIS (1972) and MERXMÜLLER & LIPPERT (1982) as expressed in KALHEBER (1994). The term leaf unless qualified, refers to major basal leaves; the term sinus refers to the space or angle between the sides of the two basal leaflobes. The depth of division of the leaf is expressed as a fraction (1/5, 1/4 etc.) which is the portion of the length of the free lobe to the radius of the leaf measured from the top of the petiole to the top of the middle lobe. Between the lobes there may be developed a more or less obvious, toothless incision so that each lobe has subparallel sides proximally. This incision is described as "long" when it exceeds twice the length of the adjacent tooth. The number of teeth is given for one side of the middle lobe and excludes the apical tooth.
Chromosome studies were made on root-tips with 0.5% colchicine and then stained in Feulgen.

I. Discription of the new species

Alchemilla ayazii Kalheber, spec. nov.
Holotypus: Turcia, Prov. Trabzon (A8), Arpali above Sürmene, 2000 m, 5.8.1994, *Hayirioglu 158* (KATO[1]; iso: hb. Kalheber).

Planta magna. Caules 30–60 cm alti, firmi et crassi, stricte erecti usque ad ramos inferiores pilis brevibus dense patenter obtecti, foliis radicalibus longiores. Foliorum radicalium petioli ad 25 cm longi, firmi sed non crassi. Laminae orbiculares 5–8 cm; sinu basali clauso, cum 9–11 lobis, ad 1/5 lobatae; supra laxius ad dense pilosae, subtus dense, in nervis primariis densissime patenter pilosae. Lobi arcuati vel paulo truncati sine incisuris integris. Dentes utroque latere (6–)7(–8) inaequales, paulo longiores quam lati, mamilliformes in apicibus paulo incurvati vel porrecti. Dens apicalis vicinis angustior et brevior. Stipulae brunnescentes, connatae; obtusatae, regulariter vel irregulariter parvae dentatae, in nervis adpresse pilosae. Folia caulina lamiis magnis orbiculata, 7–9 lobis usque ad 1/4 radii longitudine arcuatim lobata sine incisuris integris; sinus basales clausi vel angusti. Petioli foliorum inferiorum 3–4 × longiores quam laminae ut folia radicalia pilosa. Stipulia magna regulariter vel irregulariter dentata utrinque latere pilosa subtus densius. Inflorescentia ramis brevibus, glabris et erectis. Glomeruli laxi. Pedicelli glabri usque ad 3 mm longi. Flores 3–5 mm lati, flavovirides. Hypanthia glabra, sepalis manifeste breviora. Episepala longiora sed angustiora sepalis. Sepala ovata; episepala lanceolata, et uterque glabra. Rarissime unum sepalum per floram cum uno dentulo.

Stem 30–60 cm, firm, robust and strictly erect, considerably longer than basal leaves. Densely patent hairy up to the lower branches of the inflorescence. Hairs short. Petioles up to 25 cm, firm but not thick. Leaves orbicular, 5–8 cm in diameter, sparsely to densely hairy above, densely so beneath, very densely and patent on the nerves, basal sinus closed, 9–11 lobes, lobed to 1/5. Leaflobes arcuate or truncate without incisions, teeth (6–)7(–8), unequal, a bit longer than wide, mammilliform and slightly incurved or porrect. Apical tooth narrower and shorter than the adjacent laterals. Stipules brunescent, connate, obtuse, regularly or irregularly dentate with adpressed hairs on the nerves. Stemleaves large, orbicular, 7–9 lobes, divided up to 1/4, with arcuate lobes, no incisions, basal sinus closed or very narrow, hairs as in the basal leaves. Petioles of lower 3–4 times as long as blade. Stipules large, regularly or irregularly dentate, densely hairy on both sides. Inflorescence with short erect, glabrous branches. Glomeruli lax; pedicels glabrous, up to 3 mm. Flowers 3–5(–6) mm, yellowish green; hypanthia glabous, considerably shorter than the sepals. Sepals ovate, epicalyxlobes lanceolate, ± acute and glabrous, rarely one per flower with a dentical. In the hairs the plant reminds *A. oriturcica* but there are no incisions between the leaf lobes.
Chromosome Number: 2n = 64–68
The species is named in honour of Dr. Ahmed Ayaz, a Turkish botanist.

Alchemilla ayderensis Kalheber, spec. nov.
Holotypus: Turcia, Prov. Rize (A8), Camlihemsin, on the mount road of Ayder, 1450 m, 21.7.1994, *Hayirlioglu 116* (KATO; iso: hb. Kalheber).

Planta sat magna, flavoviridis. Caules 25–40 cm alti arcuato ascendentes vel erecti, tenues et graciles. Internodia caulorum dense adpresse pilosi, rami inflorescentiarum laxe adpresse pilosi vel glabri. Foliorum radicalium petioli ad 15 cm longi toti dense adpresse pilosi; laminae reniformes 6–8 cm latae et 2,5–4,5 cm longae, sinu basali aperto vel apertissimo;

[1] Karadeniz Technical University Trabzon

(9–)11 lobae ad 1/5–2/5 incisae, extus glabrae, subtus in nervis primariis et in lobis basalibus dense adpressi pilosae (pilis sericeis). Lobi parabolici paulum truncati, incisuris integris longis et distinctis separati. Dentes utrinque (6–)7–8, acuti, ad duplo longiores quam lati, plusminusve porrecti et prorsus incurvati. Dens apicalis multum angustior et paulum brevior vicinis. Stipulae brunnescentes, denticulatae et dense pilosae. Folia caulina magna, semiorbiculares vel basi truncata, petiolis brevibus, extus glabrae subtus ita pilosa ut folia radicalia; stipulia magna irregulariter dentata, in utroque latere glabra. Inflorescentia copiose ramosa, ramis divaricatis et longis. Glomeruli breves, pauciflori et laxissimi. Pedicelli tenues, 2–3 mm longi, glabri. Flores flavovirides, 2–3 mm lati, hypanthia sepalis episepalisque breviora, dense adpresse pilosa. Sepala episepalis aequilonga vel saepius longiora, acuta, elliptica, glabra. Episepala lanceolata et ut sepala acuta et glabra.

Plant rather tall, yellowish green, stem 25–40 cm, arcuate ascendent or erect, thin and slender, internodes densely adpressed hairy, branches of inflorescence laxly so or glabrous. Petioles up to 15cm, densely adpressed hairy, Leaves 6–8 cm broad and 2.5–4.5 cm long with (9–)11 lobes, divided 1/5–2/5, basal sinus wide. Blade glabrous above adpressed hairy on the main veins and the basal lobes beneath. Lobes parabolic, little truncate with long and distinct incisions, 7–8 teeth, acute and up to twice as long as wide, ± porrect and somewhat incurved. Apical tooth much narrower and little shorter than the adjacent laterals. Stipules brunescent, denticulate and densely hairy. Stemleaves large, semicircular or with truncate base and short petioles, glabrous above, hairy on the nerves and basal lobes beneath; stipules large, irregularly dentate, glabrous. Inflorescence abundantly branched. Branches divaricate and long. Glomeruli short, pauciflorous and very loose. Pedicels thin, 2–3 mm long, glabrous. Flowers yellowish, 2–3 mm wide; hypanthia shorter than sepals and epicalyxlobes, densely adpressed hairy. Sepals as long as epicalyxlobes or often longer, elliptic, acute, and glabrous. Epicalyxlobes lanceolate, acute, and glabrous. The plant reminds of *A. abchasica* but has long incisions between the lobes of the basal leaves.
Chromosome Number : 2n = 109–114
The species is named after the place where the type specimen was collected.

Alchemilla basakii Kalheber, spec. nov.
Holotypus: Turcia: Prov. Rize (A8), Basköy above Cimil, 2300m, 14.7.1993, *Hayirlioglu 28A* (KATO).

Planta mediocris vel magna. Caules 25–40 cm alti, arcuato ascendentes vel fere erecti, admodum graciles, in internodiis inferioribus mediisque dense adpresse, in internodiis superioribus sparsim pilosi. Foliorum radicalium petioli ad 15 cm longi, toti dense adpresse pilosi. Laminae reniformes vel suborbiculares 6–8 cm latae et 3,5–4,5 cm longae, planae; sinu basali angusto vel clauso; 9(–11) lobae ad 1/4–1/3 incisae, extus sparsim in plicis densius pilosae, subtus dense, in nervis primariis densissime adpresse pilosae. Lobi parabolici vel subtrianguli sine incisuris. Dentes utrinque 7–9, duplo longiores quam lati, acuti, plusminusve porrecti, vel vix paulum prorsus incurvati, inaequales, inferioribus manifeste minoribus; dens apicalis subaequilongus viciniis autem angustior. Stipulae brunnescentes, dense adpresse pilosae. Folia caulina mediocra vel magna, aeque pilosa ut folia radicalia. Petioli foliorum inferiorum laminis longiores. Folia superiora petiolis brevibus vel sessilia, stipulis inciso dentatis, dentibus porrectis, inaequalibus. Inflorescentia pauciramosa, ramis erecto-patentibus vel flexuosis. Glomeruli breves plusminusve densi; pedicelli usque ad 2,5 mm longi, glabri. Flores flavovirides, 3–4 mm lati, hypanthia sepalis episepalisque subaequilonga, glabra vel in dimidio inferiore sparsissime pilosa. Sepala late lanceolata vel anguste ovata, acuta, rarissime dentata, glabra. Episepala sepalis angustiora et breviora vel subaequilonga ut sepala dentibus parvis rarissime munita, glabra. Sepala episepalaque in fructo patentia.

Medium-sized to tall. Stem 25–40 cm, arcuate ascendent or ± erect, slender, densely adpressed hairy in the lower internodes, laxely above. Petioles of basal leaves up to 15 cm, densely adpressed hairy. Leaves reniform or suborbicular 6–8 cm wide and 3,5–4,5 cm long, basal sinus narrow or closed; 9(–11) lobes up to 1/4–1/3 divided, loosely hairy above, more densely in the folds; densely hairy beneath, on the nerves very densely adpressed hairy. Lobes parabolic or subtriangular without incisions. Teeth 7–9 up to twice as long as wide, acute, ± porrect or little incurved, unequal , the lower rather small. Apical tooth about as lang as the adjacent laterals, but much narrower. Stipules brunescent, densely adpressed hairy. Stem-leaves medium-sized or large, hairy like the basal leaves. Petioles of the lower ones longer than the blade, those of the upper ones short or leaves even sessil. Stipules incisodentate, teeth porrect, unequal. Inflorescence little branched, branches erectopatent or flexuous. Glomeruli short, ± dense, pedicels up to 2,5 mm, glabrous. Flowers yellowish, 3–4 mm wide, hypanthia about as long as the sepals and episepals, glabrous or in the lower part laxly hairy. Sepals broadly lanceolate or narrowly ovate, rarely one per flower with one dentical, glabrous. Epicalyx segments narrower and shorter or subequal, also rarely with one dentical, glabrous.
The disposition of the plant reminds of *A. acutioldola* Opiz
Chromosome Number : 2n = 70–82
The species is named after the region were the type specimen was collected.

Alchemilla beyazoglii Kalheber, spec. nov.

Holotypus: Turcia: Prov. Trabzon (A7), North slope of Zigana pass, 1700 m, 20.8.1994, *Hayirlioglu 171* (KATO; iso: hb. Kalheber).

Planta mediocris vel magna. Caules erecti, flexuosi, foliis basalibus multo longiores, inferne dense supra sparse in inflorescentia sparsissime patenter vel reflexe pilosi. Petioli foliorum radicalium ad 9 cm longi, toti patenter pilosi. Laminae reniformes vel semicircu-lares, 5–7 cm latae et 2,5–3,5 cm longae, plusminusve planae, extus dilute virides subtus pallidiores, sinu basali lato vel latissimo, 7–9 lobis, ad 1/5–1/4 incisae, in facie superiore glabrae, subtus in tota facie disperse splendenter pilosae. Lobi truncati incisuris integris parvis sed distinctissimis, dentibus utrinque 6–8, angustis distincte incurvatis subaequalibus. Dens apicalis angustior et brevior vicinis. Stipulae brunnescentes, acutiusculae aut obtusae, extus disperse pilis adpressis munitae. Folia caulina sat magna, basi plusminusve truncatae vel sinu basali latissimo, similiter ut folia radicalia pilosa. Petioli foliorum inferiorum laminis longiores. Stipulae admodum magnae, in facie superiore glabrae, subtus sparsius pilosae, regulariter plusminusve profunde dentatae. Inflorescentia sat multiflora ramis longioribus divaricatis vel suberectis. Glomeruli breves et lati et laxiusculi. Pedicelli glabri, usque ad 3 mm longi. Flores 2–3,5 mm lati, hypanthia glabra. Sepala episepalaque glabra; sepala late lanceolata vel anguste ovata, hypanthio paulo vel manifeste longiora, episepala anguste lanceolata iis plusminusve aequilonga sed angustiora.

Plant medium-sized to large. Stem erect, flexuous, much longer than the basal leaves, densely patent hairy in the lower part, laxly above, in the inflorescence nearly glabrous. Petioles of basal leaves up to 9 cm , patent hairy. Leaves reniform or semiorbicular with wide basal sinus, flat, 5–7 cm wide and 2.5–3.5 cm long, with 7–9 lobes, 1/5–1/4 divided, glabrous above, loosely sericeous beneath. Leaf lobes truncate with short but distinct incisions, 6–8 narrow, distinctly incurved, subequal teeth. Apical tooth narrower and shorter than the adjacent laterals. Stipules brunescent, acute or obtuse loosely adpressed hairy below. Stem leaves large, with ± truncate base or very wide sinus, hairy as the basal leaves. Petioles of the lower longer than the blade. Stipules rather large, glabrous above, laxly hairy beneath, ± deeply toothed. Inflorescence rather multiflorous, branches long, divaricate or suberect. Glomeruli short and lax. Pedicels up to 3 mm, glabrous. Flowers 2–3.5 mm wide. Hypanthia, sepals and epicalyxlobes glabrous. Sepals lanceolate, epicalyxlobes narrowly lanceolate, both

subequilong and both longer than the hypanthium. In hairiness the plant reminds of *A. hessii* but the shape of the leaf lobes is completely different.
Chromosome Number : 2n = 76–84
The species is named in honour of Prof. Dr. O. Beyazoglu the PhD advisor of Mrs. Sema Hayirlioglu-Ayaz.

Alchemilla akdoganica Kalheber, spec. nov.
Holotypus: Turcia: Prov. Trabzon (A8), Akdogan köy above Caykara, 1700 m, 28.6.1994, *Hayirlioglu 75* (KATO).

Planta mediocris. Caules erecti, tenues et graciles, foliis basalibus plusminusve duplo longiores, usque ad inflorescentiam dense patenter pilosi, ramuli supremi glabri. Petioli foliorum basalium ad 6cm longi, toti dense patenter pilosi. Laminae reniformes 3,5–5 cm latae et 2–3 cm longae. Lamina extus dilute viridis subtus pallidior, sinu basali angusto, plusminusve plana, cum 7–9 lobis, ad 1/4 incisae, in facie superiore glabra, subtus in tota facie dense splendide pilosa. Lobi arcuati vel semicirculares incisuris integris parvis sed distictis. Dentes in utroque latere 6–7 subaequales vel paulum superne accrescentes, oblique triangulares vel pauce mammiliformes, distincte incurvati, aeque longi ac lati. Dens apicalis angustior vel brevior vicinis. Stipulae brunnescentes, in facie superiore glabrae, subtus sericanter adpresse pilosae. Folia caulina sat magna, basi plusminusve truncati vel sinu basali lato, 5–7-lobata, similiter ut folia radicalia pilosa et dentata. Petioli foliorum inferiorum 2–3 × longiores quam laminae. Folia caulina superiora parve petiolata. Stipulae in facie superiore glabrae, subtus pilosae, irregulanter plusminusve profunde dentatae. Inflorescentia sat multiflora, ramis plusminusve divaricatis. Glomeruli breves et lati, laxiusculi. Pedicelli glabri usque ad 2 mm longi. Flores ad 2,5 mm lati; hypanthia in parte inferiore dense patenter pilosa. Sepala episepalaque rarissime singulis pilis in apice munita. Sepala oblonge ovata, hypanthio paulo vel manifeste longiora. Episepala anguste ovata iis breviora vel subaequilonga.

Medium-sized, stem erect, thin and slender, about twice as long as the basal leaves, up to the inflorescence densely covered with patent hairs, the uppermost branches glabrous. Petioles of basal leaves up to 6 cm, densely patent hairy. Blade reniform 3.5–5 cm wide and 2–3 cm long, green above, glaucous green beneath, ± plane, 7–9 lobes, divided up to 1/4; glabrous above, densely silky hairy beneath. Leaflobes arcuate or semicircular with short but distinct incisions, 6–7 ± equal teeth, upwards a little bit accrescent, oblique triangular or mammilliform, distinctly incurved and as long as wide. Apical tooth narrower and shorter than the adjacent laterals. Stipules brunescent, glabrous above, adpressed sericeous beneath. Stemleaves rather large, truncate or with wide basal sinus, 5–7 lobes. Dentate and hairy as the basal leaves. Petioles of the lower stem leaves 2–3 times as long as the blade, upper stemleaves shortly pediolate. Stipules glabrous above, hairy beneath, irregular, ± deeply dentate. Inflorescence with divaricate branches, abounding in flowers. Glomeruli short, wide, and lax. Pedicels to 2 mm, glabrous. Flowers up to 2.5 mm wide. Hypanthia densely patent hairy in lower part. Sepals and epicalyx lobes with sigle hairs on top. Sepals ovate-lanceolate, longer than hypanthium. Epicalyx lobes narrowly ovate, shorter than or as long as sepals.
Chromosome Number: 2n = 100–105.
The species is named after the place where the type specimen was collected.

Alchemilla hayirlioglii Kalheber, spec. nov.

Holotypus: Turcia, Prov. Travzon (A7) on the side of Degimendere, Zigana 1750 m, 15.7.1994, *Hayirilioglu 107* (KATO).

Planta mediocris vel parva, dilute viridis. Caules ad 20 cm alti, erecti vel arcuato ascendentes, tenues et graciles, inferne sparsius supra sparsissime patenter vel erectopatenter pilosi, in inflorescentia glabri. Foliorum radicalium petioli ad 6cm longi, graciles et tenues, dense patenter pilosi, indumento in foliis primariis sparsiore. Laminae reniformes vel suborbiculares usque ad 4 cm longae et 5 cm latae, utrinque dilute viridis subtus pallidior, sinu basali angusto vel clauso, plusminusve planae, 7-lobatae, ad 1/4–1/3 incisae, in facie superiore glabrae, subtus in nervis primariis et in lobis basalibus sparsius patenter pilosae, inter nervos glabrae. Lobi truncati vel semicirculares incisuris brevibus sed semper distinctis. Dentes in utroque latere 4–5, infimi parvi, superiores maiores, distincte inaequales, porrecti, lateribus convexis, longiores quam lati. Dens apicalis angustior et brevior vicinis. Stipulae brunnescentes, apicibus obtusis in nervis adpresse pilosae. Folia caulina mediocra vel parva, 5–7 lobata, petiolibus brevibus, basi truncato vel sinu basali lato, usque ad 1/3 truncato lobata, incisuris integris disdinctissimis instructa, similiter atque folia radicalia pilosa. Stipulae irregulariter incisodentatae, subtus et extus glabrae. Inflorescentia satis pauciflora, ramis glabris et erectis. Glomeruli laxi. Pedicelli glabri. Flores 3,5–5 mm lati, flavovirides. Hypanthia omnia in basi plusminusve dense patenter pilosa. Sepala episepalaque glabra. Sepala oblonge-ovata, hypanthio paulo vel manifeste longiora. Episepala anguste vel late ovata iis plusminusve aequilonga sed tenuiora.

Medium-sized or small. Stem up to 20 cm, erect or arcuately ascending, thin and slender, sparsely patent hairy in the lower part, upwards nearly glabrous, glabrous in the inflorescence. Petioles of basal leaves up to 6 cm long, slender and thin, densely patent hairy, indumentum in spring leaves sparse. Blade reniform or suborbicular, up to 4 cm long and 5 cm wide. Basal sinus narrow or closed. Leaves ± plane; 7 lobes, up to 1/4–1/3 divided, glabrous above, laxly patent hairy on the nerves and basal lobes otherwise glabrous beneath. Leaflobes truncate or semicircular with short but always distinct incisions, 4–5 teeth, the lower ones smaller than the upper ones, distinctly sparsely patent hairy in the lower part, upwards nearly glabrous, glabrous in the inflorescence. unequal, porrect with convex sides, longer than wide. Apical tooth narrower and shorter than the adjacent laterals. Stipules brunescent, obtuse, adpessed hairy on the nerves. Stemleaves medium-sized or small, 5–7 lobes, with short petioles, truncate at base, up to 1/3 divided in truncate lobes, with very conspicuous incisions. Hairy as the basal leaves. Irregularly incised dentate, glabrous on both sides. Branches of the inflorescence erect. Inflorescence moderately few-flowered. Glomeruli lax. Pedicels glabrous. Flowers 3.5–5 mm wide, yellowish green. Hypanthia ± densely, patent hairy in the lower third. Sepals and epicalyx lobes glabrous, little or distinctly longer than the hypanthium. Epicalyx lobes narrower then sepals, but of the same length.
In her disposition the plant reminds of some species of the series *Pubescentes*.
Chromosome number : 2n = 70–74.
The species is named in honour of the family of the co-author Dr. Sema Hayirioglu-Ayaz.

II. Key for the *Alchemilla* species of NE- and E-Anatolia

The key covers the species that are found in the vilayets of Ordu, Giresun, Trabzon, Rize and Coruh (Artvin), Kars, Gümüsane, Erzincan, Erzurum, Agri, Tunceli, Elazig, Bingol, Mus, Diyarbakir, Siirt, Bitlis, Van, Mardin and Hakkari as well as the adjacent parts of Transcaucasia and Iran. It follows widely that of Pawlowski & Walters (1972) and Kalheber (1994) and in some respects Fröhner (1969), Juzepczuk (1934 and 1941), Grossheim (1952) and Hayirlioglu & Beyazoglu (1997, 1).

1. Leaves divided to base or nearly so 2
– Leaves lobed to 1/2(–2/3) at most 3
2. All leaf segments completely free, often the outer 2 on each side of the leaf fused for up to 1/5 of their length *A. sericea* Willd.
– Only the middle leaf-segments free, the outer all (normally 3) fused up to 1/10–1/5 of their length *A. rizensis* B. Pawl.
3. Sepels as long as or shorter than the more or less campanulate hypanthium; epicalyx lobes mostly shorter than sepals; achenes not or only slightly longer than hypanhium 4
– When the seeds are ripe sepals and achenes distinctly longer than the conical hypanthium; epicalyx lobes as long as or longer than the sepals, very rarely shorter at anthesis 25
4. Whole plant, including all pedicels throughout all of their length, densely hairy 5
– Some parts of the plant sometimes only parts of the upper surface of the leaves or distal part of some pedicels or hypanthia glabrous 9
5. At least some hairs on petioles and lower part of stem distinctly deflexed 6
– Hairs on stems and petioles patent, erecto-patent or adpressed – after heavy rainfall patent hairs sometimes are a little bit deflexed or bent downwards 7
6. Leaf lobes more or less truncate, separated by obvious toothless incisions, teeth 4–5(6) *A. erythropoda* Juz.
– Leaf lobes rounded or almost triangular, with very shallow toothless incisions between them; leaf teeth 6–7(8) *A. lithophila* Juz.
7. Hairs usually adpressed or sub-adpressed, plant up to 30 cm *A. sericata* Reichenb.
– Hairs erecto-patent or patent, plant up to 15 cm 8
8. All pedicels with dense erecto-patent pubescens *A. caucasica* Buser
– Some pedicels with only few erecto-patent hairs, others with a dense indumentum of the same type *A. plicatissima* Fröhner
9. All hypanthia hairy 10
– All hypanthia glabrous or on the same plant some hypanthia glabrous and some hairy 19
10. Some pedicels hairy at least in part 11
– All pedicels glabrous 14
11. Upper surface of leaves sparsely or patchily hairy (sometimes only very few hairs in the folds or on the teeth of leaf, it is possible that the margin of the leaf is ciliate, these hairs are not meant here *A. surculosa* Fröhner
– Upper surface of leaves densely and evenly hairy 12
12. Hairs on petioles and lower part of stems erecto-patent; dwarf plant up to 10 cm *A. plicatissima* Fröhner
– Hairs on petioles and lower part of stems patent or deflexed; medium sized plant up to 20(–40) cm 13
13. Leaves orbicular, (7–)9 lobes; pedicels variably hairy *A. valdehirsuta* Buser
– Leaves reniform, 7 lobes; all pedicels hairy in proximal part *A. grossheimii* Juz.
14. Leaf lobes separated by deep toothless incisions; teeth much longer than wide *A. pectiniloba* Fröhner
– Leaf lobes with small or no incisions between them; Teeth about as long as wide 15
15. Some hairs on stems and lower part of petioles deflexed 16
– All hairs on lower part of stems and petioles patent or erecto-patent 17
16. Leaves orbicular, sinus narrow, basal lobes touching or overlapping *A. compactilis* Juz.
– Leaves reniform, sinus open, basal lobes widely separated *A. crinita* Buser
17. Dwarf plant (less than 8 cm), leaves reniform with wide basal sinus *A. microscopia* Fröhner
– Medium sized to tall plant (up to 50 cm), leaves orbicular with narrow or closed basal sinus 18

18. Hairs on stems and petioles erecto-patent; hypanthia densely hairy *A. stevenii* Buser
– Hairs on stems and petioles patent, hypanthia variably, mostly sparsely hairy *A. monticola* Opiz
19. Lower part of stems and petioles of summer leaves with patent or deflexed hairs 22
– Stems and petioles either with adpressed or subadpressed hairs at least on summer leaves 20
20. Reniform and orbicular leaves present, both types with narrow or closed sinuses; teeth acute of equal size *A. minusculiflora* Buser
– Leaves reniform with wide basal sinus, teeth subacute to ± obtuse, unequal 21
21. Leaves glabrous above, hairy on the main veins beneath only; stems adpressed hairy in the lower half, glabrous above; flowers yellow or yellowish green *A. pseudocartalinica* Juz.
– Spring-leaves glabrous above, summer-leaves hairy above in the folds and at the margin; sparcely adpressed hairy beneath; stems hairy on their entire length, sparsely so above; flowers green *A. daghestanica* Juz.
22. Upper surface of leaves glabrous or with some hairs near the edge and on the teeth *A. heterophylla* Rothm.
– Upper surface of leaves with hairs at least in the folds 23
23. Petioles of spring-leaves glabrous, those of summer-leaves with patent hairs; stems glabrous in upper half including the inflorescens *A. oligotricha* Juz.
– All petioles hairy; stems hairy at least up to the second branch of inflorescens 24
24. Leaves orbicular with basal lobes touching or overlapping *A. compactilis* Juz.
– Leaves reniform with wide open sinus, basal lobes widely separated *A. crinita* Buser
25. Stems and petioles with patent or erecto-patent hairs 26
– Stems and petioles glabrous or with adpressed hairs 50
26. All pedicels ± densely hairy 27
– All pedicels glabrous or some of them sparsely hairy in proximal part 31
27. Sepals and epicalyx-lobes glabrous 28
– Sepals and epicalyx-lobes spacely hairy and sparcely ciliate 29
28. Stems, petioles and pedicels with erecto-patent hairs; leaf lobes with 5–8 subequal teeth *A. orthotricha* Rothm.
– Stems, petioles and pedicels with patent hairs; leaf lobes with 7–11 very unequal teeth *A. erzincanensis* B. Pawl.
29. Glomeruli dense, elongated up to 3 times as long as broad; leaves with wide sinus *A. orduensis* B. Pawl.
– Glomeruli lax and short; leaves with narrow or closed sinus 30
30. Leaves sparsely hairy on both surfaces, in spring-leaves hairs restricted to the main veins beneath; inflorescence rather wide and manyflowered with divaricate branches *A. hirtipedicellata* Juz.
– Leaves densely hairy on both surfaces; inflorescence rather narrow *A. holotricha* Juz.
31. All leaves hairy on both surfaces 32
– At least the upper surface of the leaves not densely and evenly hairy 36
32. Leaves divided to more than 1/3, with long toothless incisions, lobes parabolic to semi-elliptic *A. hemsinica* Kalheber
– Leaves lobed to 1/4 (with distinct lobes) 33
33. Flowers 4.5–6.5 mm wide, lower pedicels in each glomerulus sparsely hairy in proximal part *A. porrectidens* Juz.
– Flowers 3.5–5 mm wide, all or almost all pedicels glabrous sometimes 1 or 2 in each glomerulus with few hairs in any part 34

34. Stems hairy almost throughout, at least 5/6; leaves with narrow or closed sinus 35
– Stems glabrous in their upper 1/4–1/3; leaves with rather wide sinus *A. amoena* (Czeczott) Rothm.
35. Leaf lobes truncate with short but distinct incisions; teeth 3–5(–6) *A. bornmuelleri* Rothm.
– Leaf lobes not truncate, with no incisions, teeth 6–10 *A. mollis* (Buser) Rothm.
36. At least some hypanthia ± hairy 37
– All hypanthia glabrous 47
37. Upper surface of at least some leaves hairy, at least in the folds, but always some parts of the leaves glabrous 38
– Upper surface of all leaves glabrous 42
38. Leaf lobes at least partly subtriangular 39
– Leaf lobes arcuate, semi-orbicular or semi-elliptic 40
39. Stems hairy up to and including the pedicels; hypanthia densely hairy *A. speciosa* Buser
– Stems glabrous in the upper 2/3; basal and lower caulin leaves ± glabrous above, remainder sparsely hairy above *A. armeniaca* Rothm.
40. Leaf lobes semi-orbicular or semi-elliptic without incisions; stems hairy throughout *A. persica* Rothm.
– Leaf lobes arcuate or truncate; stems glabrous in the upper part 41
41. Leaf lobes arcuate with short, but distinct incisions *A. oriturcica* B. Pawl.
– Leaf lobes truncate without incisions *A. ayazii* Kalheber
42. All leaves divided to more than 1/3 43
– Leaves not divided to more than 1/4 44
43. Leaves reniform with wide open sinus, lobes long parabolic to semi-elliptic with long incisions *A. cimilensis* Kalheber
– Leaves suborbicular or reniform with closed sinus or very narrow one, lobes obovate, ± truncate *A. hayirlioglii* Kalheber
44. Leaf lobes truncate to arcuate; glomeruli lax 45
– Leaf lobes rounded, semi-circular or parabolic; leaves reniform or orbicular-reniform, sinus mostly closed, but open in some leaves; glomeruli dense *A. kackarensis* Kalheber
45. Leaves with narrow sinus 46
– Leaves broadly reniform with very broad sinus *A. epipsila* Juz.
46. Stems densely hairy up to the last branches of the infloerescens, only pedicels glabrous; caulin leaves divided to more than 1/3 with parabolic lobes and distict incisions *A. akdoganica* Kalheber
– Stems densely hairy on lower internodes, laxly in the upper and very laxly in the inflorescence; upper caulin leaves divided to less than 1/4 with flat arcuate lobes without incisions *A. ikizdereensis* Kalheber
47. Stems hairy throughout, leaves without toothless incisions *A. sintenisii* Rothm.
– Stems hairy in lower part up to the first branches of inflorescence, some of these laxly hairy 48
48. Leaves orbicular with narrow or closed sinus and short but distinct incisions *A. elevitensis* Kalheber
– Leaves reniform with very wide sinus 49
49. Leaf lobes arcuate, semi-orbicular or slightly truncate, without toothless incisions *A. hessii* Rothm.
– Leaf lobes broadly truncate with distinct toothless incisions *A. beyazoglii* Kalheber
50. Hypanthia hairy 51
– All hypanthia glabrous 60

51. Leaves densely hairy on both surfaces 52
– Upper surface of leaves glabrous or only sparsely hairy in the folds; all pedicels glabrous 53
52. Epicalyx lobes glabrous; the lower pedicels in each glomerulus with ± dense subadpressed hairs in their proximal part *A. ziganadagensis* B. Pawl.
– Epicalyx lobes sparcely hairy; all pedicels hairy throughout *A. trabzonica* Hayirlioglu-Ayaz & Beyazoglu
53. Leaves distictly reniform 54
– Leaves suborbicular to orbicular-reniform with closed or open sinus 56
54. Stems subadpressed hairy in lower 1/10–1/2, glabrous above; leaf lobes rounded-parabolic *A. buseriana* Rothm.
– Stems adpressed hairy throughout 55
55. Leaves with distinct incisions between the lobes; teeth rather equal *A. ayderensis* Kalheber
– Leaves without incisions between the lobes; teeth rather unequal *A. abchasica* Buser
56. All leaves with open sinus; hypanthia glabrous and sparsely hairy in the same glomerulus *A. stricta* Rothm.
– At least some leaves with closed sinus; all hypanthia hairy at least in proximal part 57
57. Stems rigid and ± robust, sparsely hairy in the lower 1/5–1/3; hypanthia hairy throughout *A. ciminensis* B. Pawl.
– Stems slender, densely hairy up to the first branches of the inflorescence, variously above 58
58. All hypanthia densely hairy in lower half 59
– Hypanthia with single hairs only in lower half, some glabrous *A. basakii* Kalheber
59. Flowers 3–4.5(–5) mm wide; stems slender but rather firm, erect, densely hairy in lower 1/2–3/4, glabrous or very laxly above *A. barbatiflora* Juz.
– Flowers (4.5–)5–6 mm wide; stems arcuate ascendant, flexous *A. tiryalensis* B. Pawl.
60. Leaf lobes with rounded apex, without or with only short incisions 61
– Leaf lobes ± truncate separated by conspicuous incisions 63
61. Flowers 4.5–5.5 mm wide, leaves lobed to 2/5–1/2 *A. transcaucasica* Rothm.
– Flowers small, 2–4(–4.5) mm wide 62
62. Leaves orbicular-reniform with open, but normally narrow sinus; flowers 2–3,5 mm wide *A. procerrima* Fröhner
– Leaves reniform with wide open sinus; flowers 3–4(–4.5) mm wide *A. ancerensis* Kalheber
63. Stems glabrous or sparsely hairy in lower 1/3 64
– Stems hairy up to the inflorescence, densely so below 65
64. Leaves lobed to 1/4–3/7 with small teeth; caulin leaves small, distinctly lobed *A. retinervis* Buser
– Leaves lobed to 1/5–1/3, with fairly large teeth; caulin leaves large only shallowly lobed *A. dura* Buser ex Rothm.
65. Leaves densely adpessed hairy beneath on the entire surface *A. venosa* Juz.
– Leaves adpressed hairy beneath only on the veins and often also on the basal lobes *A. ellenbergiana* Rothm.

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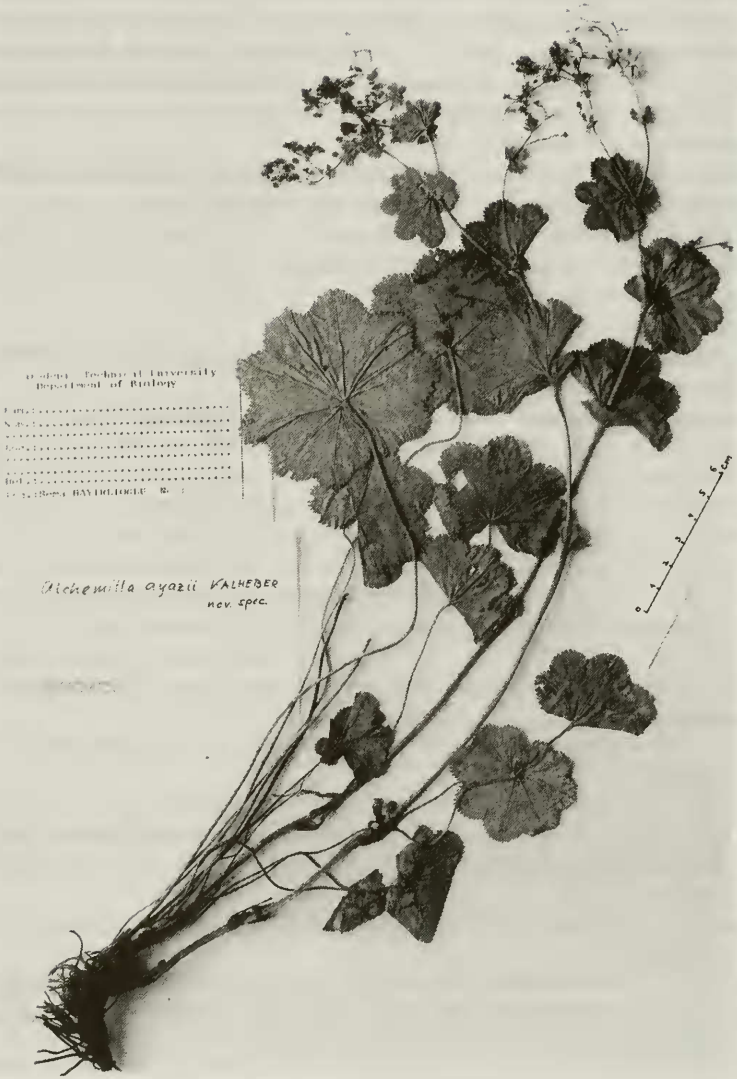

Alchemilla ayazii Kalheber, holotype

Alchemilla ayderensis Kalheber, holotype

Alchemilla basakii Kalheber, holotype

Alchemilla beyazoglii Kalheber, holotype

Alchemilla akdoganica Kalheber, holotype

Alchemilla hayirlioglii Kalheber, holotype